MARICOPA ASSOCIATION of GOVERNMENTS

MAG ITS Strategic Plan Update

Technical Memorandum #4

- ITS User Services for the MAG Region
- ITS Market Packages for the MAG Region

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February 24, 2000
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1. INTRODUCTION

Technical memorandum Number 4 summarizes the efforts of Task 6 (review and update the ITS user service focus from the 1995 MAG ITS strategic plan) and Task 7 (identify and screen ITS market packages). These two tasks are discussed in further detail below.

User services describe what the MAG intelligent transportation system will do from the user's perspective. To date, thirty-one user services have been jointly developed by the USDOT and ITS America with substantial stakeholder input. The MAG region logical system architecture, to be addressed in the subsequent tasks of this project, will define the processes (the activities or functions) that are required to satisfy the user services identified in Task 6.

Market packages provide a deployment-oriented perspective to the MAG regional architecture. They group ITS technologies that work together to deliver a given transportation service. In other words, market packages identify the pieces of the physical system architecture that are required to implement a particular transportation service. While ITS user services describe what MAG needs to provide to its transportation users, market packages focus on how these services will actually be delivered.

The first part of this technical memorandum summarizes the activities of Task 6 – R*eview and Update User Service Focus*. Task 6 developed an integrated user service plan (USP) that addresses the MAG region's transportation needs through the selection of appropriate ITS user services. The methodology used to develop the USP consisted of two key steps:

- Review of the ITS user services identified for the region in the original (1995) MAG ITS Strategic Plan; and
- Review of the current list of 31 ITS user services for applicability within the MAG region.

Key activities included:

1. Review the user services selected in the original ITS Strategic Plan in view of the current status of ITS deployments in the MAG region. This activity, which took into consideration the recently identified regional ITS objectives, provided a valuable insight into the transportation needs that require continued emphasis in the region.

2. Identify needed user services. The MAG region's transportation-related needs, identified in Task 5 of this study, were matched with the currently defined 31 ITS "urban" user services, resulting in a set of candidate user services to be deployed in the MAG region. These user services were then prioritized based on the relative ranking of each need, which were also developed in Task 5.

3. Formulate objectives to be achieved by implementing the identified user services. A system objective identifies the improvements in the system that can be expected to occur as a result of a successful implementation of a user service. System objectives were developed from the perspective of addressing the identified ITS needs in the region.

4. Develop user service performance criteria. To judge the degree of success of the implementation of each user service, including the effectiveness of the deployed service or technology in solving the original problem, a set of performance criteria were developed. These criteria constitute a set of possible measures which can be used to evaluate the effectiveness of deployment or degree of success of each user service that will be deployed.

5. Develop an integrated user service plan (USP). User services selected for potential deployment were combined into groups or bundles based on similar objectives and overlapping functionality. These user service bundles were then categorized in terms of short-, medium-, and long-term implementation potential.

The purpose of the second part of this technical memorandum, based on Task 7 – *Identify and Screen ITS Market Packages*, is to develop a list of applicable market packages for the MAG region and to prioritize these market packages and associated projects into high, medium, and low priority and short-, mid-, and long-term deployments.

2. AVAILABLE USER SERVICES

The National ITS Architecture currently defines 31 user services applicable to most deployment areas as well as six "rural" user services. The 31 user services have been commonly referred to as having an "urban" flavor. Only those 31 user services have been considered for this deployment plan update. They are grouped into seven bundles, as shown below in **Table 1**:

Table 1 – Available User Services

No.	User Service Bundle	Brief Description
1	**Travel and Traffic Management**	
1.1	Pre-trip travel information	Provides information for selecting the best transportation mode, departure time, and route.
1.2	En-route driver information	Provides driver advisories and in-vehicle signing for convenience and safety.
1.3	Route guidance	Provides travelers with simple instructions on how to best reach their destinations.
1.4	Ride matching and reservation	Makes ride sharing easier and more convenient.
1.5	Traveler services information	Provides a business directory or "yellow pages" of service information.
1.6	Traffic control	Manages the movement of traffic on streets and highways.
1.7	Incident management	Helps public and private organizations quickly identify incidents and implement a response to minimize their effects on traffic.
1.8	Travel demand management	Supports policies and regulations designed to mitigate the environmental and social impacts of traffic congestion.
1.9	Emissions testing and mitigation	Provides information for monitoring air quality and developing air quality improvement strategies.
1.10	Highway-rail intersection	Provides improvements to automated crossing control systems.
2	**Public Transportation Management**	
2.1	Public transportation management	Automates operations, planning, and management functions of public transit systems.
2.2	En-route transit information	Provides information to travelers using public transportation after they begin their trips.
2.3	Personalized public transit	Provides flexibly routed transit vehicles to offer more convenient customer service.
2.4	Public travel security	Creates a secure environment for public transportation patrons and operators.
3	**Electronic Payment**	
3.1	Electronic payment services	Allows travelers to pay for transportation services electronically.
4	**Commercial Vehicle Operations**	
4.1	Commercial vehicle electronic clearance	Facilitates domestic and international border clearance by minimizing stops.
4.2	Automated roadside safety inspection	Facilitates roadside inspections.
4.3	On-board safety monitoring	Senses the safety status of a commercial vehicle, cargo, and driver.

Table 1 – Available User Services

No.	User Service Bundle	Brief Description
4.4	Commercial vehicle administrative processes	Provides electronic purchasing of credentials and automated mileage and fuel reporting and auditing.
4.5	Hazardous material incident response	Provides immediate description of hazardous materials to emergency responders.
4.6	Commercial fleet management	Provides communication between drivers, dispatchers, and intermodal transportation providers.
5	**Emergency Management**	
5.1	Emergency notification and personal security	Provides immediate notification of an incident and immediate request for assistance.
5.2	Emergency vehicle management	Reduces incident response time for emergency vehicles.
6	**Advanced Vehicle Safety Systems**	
6.1	Longitudinal collision avoidance	Helps prevent head-on, rear-end or backing collisions between vehicles, or between vehicles and other objects or pedestrians.
6.2	Lateral collision avoidance	Helps prevent collisions when vehicles leave their lane of travel.
6.3	Intersection collision avoidance	Helps prevent collisions at intersections.
6.4	Vision enhancement for crash avoidance	Improves the driver's ability to see the roadway and objects that are on or along the roadway.
6.5	Safety readiness	Provides warnings about the condition of the driver, the vehicle, and the roadway.
6.6	Pre-crash restraint deployment	Anticipates an imminent collision and activates passenger safety systems before the collision occurs, or much earlier in the crash event than is currently feasible.
6.7	Automated vehicle operation	Provides a fully automated, "hands-off" operating environment.
7	**Information Management**	
7.1	Archived data function	Provides the historical data archive repositories and controls the archiving functionality for all ITS data

There are additional user services currently being considered by the National ITS Architecture team, including:

- Intermodal freight services
- Advanced construction and maintenance systems
- Emergency management services
- Law enforcement

Because these proposed user services have not yet been incorporated into the National ITS Architecture, they were not considered in this effort; however, a closer review of these additional user services may be recommended before this Strategic Plan Update is finalized.

3. USER SERVICES IDENTIFIED IN 1995

The original MAG user service plan, developed in 1995, presented the primary goals, objectives and user services which were likely to achieve early deployment success in the region. The following user services, addressing the needs identified in that study, were selected:

- Pre-trip travel information;
- En-route driver information;
- Traveler services information;
- Route guidance;
- En-route transit information;
- Emergency notification and personal security;
- Traffic control;
- Incident management;
- Emergency vehicle management;
- Emissions testing and mitigation;
- Public travel security;
- Ride matching and reservations;
- Demand management and operations;
- Public transportation management;
- Personalized public transit;
- Electronic payment;
- Commercial fleet management;
- Longitudinal collision avoidance;
- Intersection collision avoidance; and
- Vision enhancement for collision avoidance.

Of the user services that matched identified user needs, eight were found to best represent the focus of early deployment of ITS initiatives in Maricopa County. These user services were considered as the user services most likely to succeed and became the focus of the 1995 ITS Strategic Plan. The eight user services are identified in **Table 2**.

Table 2 – 1995 User Services and User Service Bundles Based on the Needs of Maricopa County

User Service Bundle	User Services Emphasized Based on Maricopa County's Needs, Systems and Problems
Travel and Traffic Management	▪ Pre-trip travel information ▪ En-route driver information ▪ Route guidance ▪ Traveler services information ▪ Traffic control ▪ Incident management
Public Transportation Management	▪ Public transportation management ▪ Personalized public transit

The 1995 ITS Strategic Plan focused on concurrent deployment possibilities, which were best represented in Maricopa County by traffic control systems, a regional multi-modal traveler information center, and the development of an incident management program on surface streets. In order to deploy the user services relating to these basic features, the following fundamental system enhancements were recommended:

- Enhancement of traffic control systems' surveillance and detection capability;
- Expansion of infrastructure-based communication system linking field equipment with traffic management centers;
- Development of formal interagency agreements for information sharing and coordination;
- Development of software and a real-time data base system(s) for information processing and dissemination;
- Identification of sufficient resources for operations, maintenance, and management of the systems, programs, or resulting subsystem elements;
- Funding enhancements, especially related to the growth of transit facilities, in order to encourage technological means of improving transit efficiency; and
- Assessment of the willingness of private agencies to share information regarding their operations.

While a number of ITS deployments have taken place or are being implemented at this time in the MAG region, a great deal remains to be done to address the needs of the transportation stakeholders. Since the completion of the original ITS plan, the Phoenix area has benefited from continued deployment and integration of ITS, including an innovative public/private partnership to develop and operate the AZTech™ multi-jurisdictional transportation management system. AZTech™, currently in its second phase of implementation, links the valley's cities and towns through a network of AZTech™ workstations which collect and disseminate traffic data and information. SMART corridors were identified and implemented with CCTV cameras, variable message signs and detection. Automated vehicle location was implemented on many of the Valley's buses as part of AZTech™ and real-time schedule information is being incorporated at transit centers. A number of traveler information devices, such as kiosks, Internet, cable television and pagers, were also implemented as part of the AZTech™ project.

The Arizona Department of Transportation Freeway Management System (FMS) has gained many additional miles of fiber optic communications connecting CCTV cameras and variable message signs placed strategically along the main highway corridors in the valley. The use of the FMS' live video feeds by the media and via the web has become widespread.

The Cities of Phoenix and Tempe are currently in the process of implementing downtown special event traffic and parking management systems. In Phoenix, work also is underway to port many of the city's traffic signals to a NTCIP compliant communications system. In Tempe, the RHODES project is testing real-time adaptive signal control on city streets.

Work has progressed towards the deployment of a modern traffic signal system in the city of Peoria, which has recently finalized the feasibility study for the system. City of Glendale is in the process of upgrading its signal system's communications to fiber optics. In Mesa, several miles of new fiber optic communication are being installed to support ITS infrastructure. Most of the other cities in Maricopa County are also continually upgrading their signal equipment.

The Phoenix International Raceway (PIR) was the first large private entity in the valley to seek ITS solutions to help manage event traffic on freeways and arterials near the valley. In

partnership with the Maricopa County Department of Transportation, PIR has developed a phased implementation plan for the ITS elements that were selected and will begin a design phase of the project in the near future.

4. 2000 CANDIDATE USER SERVICES

MAG's regional transportation needs and need priorities, identified in Technical Memorandum Number 3, were matched with the 31 ITS user services in order to identify candidate user services to best address those needs. The candidate user services were then prioritized (based on the relative weight of each matched need), to help identify those which are most needed or critical to successful ITS deployment in the region.

Table 3 lists the top 26 identified ITS user needs, prioritized by their ranking (score) as assigned by the region's ITS stakeholders.

Table 3 – Identified User Needs

ID#	Need	Score
1	Need to integrate signal systems with freeway management system	91
2	Need improved incident clearance at freeway interchanges	68
4	Need to enhance regional signal coordination/improve progression	67
5	Need to reduce incident clearance time	64
6	Need to improve accuracy and timeliness of traffic information to public	60
7	Need to improve VMS utilization with more traffic/incident information	47
8	Need to improve incident detection and notification to motorists	47
10	Need to increase inter- and intra-agency coordination	38
11	Need real-time transit schedule information	30
12	Need more accurate info. About road construction/closures and alternate routes	29
13	Need bus priority at traffic signals	29
15	Need to develop and facilitate ITS education and marketing efforts to public	28
16	Need enhanced traffic management capabilities for special events	27
17	Need to increase use of computerized traffic signals	26
18	Need to improve real-time communication between TMCs and CVOs	25
19	Need to increase use of HAR or AM/FM radio	23
20	Need in-vehicle traffic information	22
21	Need more advanced warning at RR/street crossings	21
22	Need to increase use of automated enforcement tech. (red lights, speed, etc.)	21
23	Need to integrate transit information with arterial and freeway management systems	21
24	Agencies need more traffic data to plan infrastructure improvements	20
25	Need freeway call boxes	20
26	Need AVL for transit	19
32	PSAPs need access to real-time traffic information	12
49	Need enhanced information at transit centers	5
52	Need to increase use of detector data/travel time data	3

The needs were then matched with the 31 user services to identify which user services would help achieve the need. In **Figure 1**, the need score is placed in the column of each user service that is required to achieve that need. Through this matching, all of the user services which are required to meet the stakeholder needs in the MAG region are identified.

Prioritization of the user services was based on the ranking of each of the needs. The importance (or ranking) of each user services was determined by adding up the numerical scores of all the needs matched to that particular user service. The resulting user service priorities are illustrated in **Figure 2**.

FIGURE 1

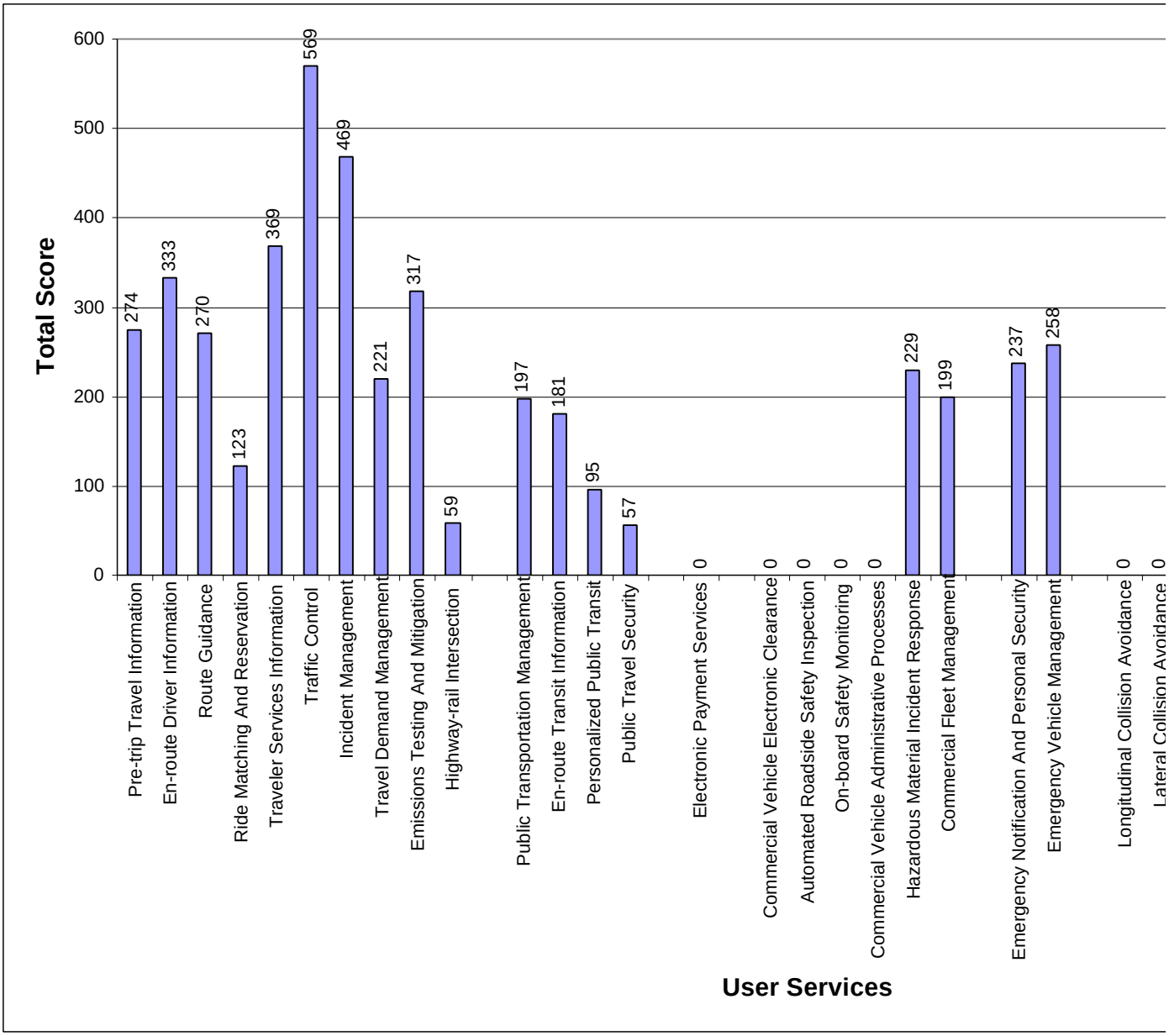
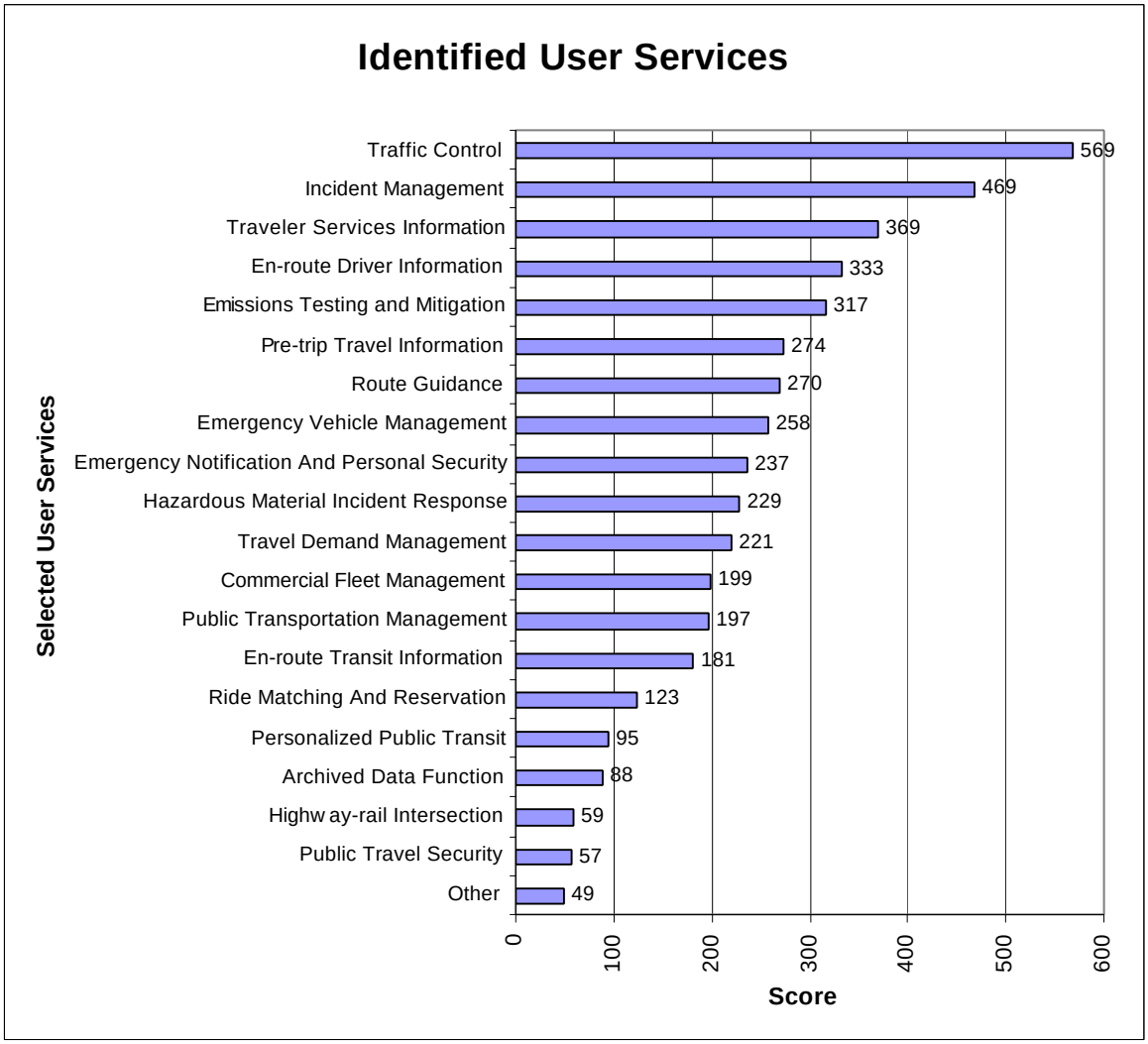


Figure 2 - User Service Ranking

Based on the relative score of each user service, a set of user services recommended for deployment in the MAG region was identified. These user services, shown in **Figure 3**, are anticipated to achieve early deployment success in the MAG region and should be considered top priority. **Figure 3** is not intended to exclude other user services as needed in specific areas; however, this list of user services represents recommendations of region-wide services on which the remainder of this updated strategic deployment plan will be based.

Figure 3 – Selected User Services



The following words, paraphrased from the National ITS Architecture, provide additional perspective on the importance of flexibility in selecting and implementing user services:

A main consideration to the architecture development is the variation in user service capabilities. There will be significant differences in the degree that each of the selected user services is deployed and integrated, based on time frame and jurisdictional constraints. Not all user services will be implemented to the highest level of functionality and integration possible. The successful architecture will be one that has the desired variations in user service functionality, which is recognized and reflected in the functional decomposition of the system requirements.

5. USER SERVICE OBJECTIVES AND DEPLOYMENT TIMEFRAMES

5.1 User Service Objectives

The needs identified for the MAG transportation region were scrutinized for commonalties and six classes of needs were identified that express the shared goals of those needs. These goals can be thought of as the system objectives that must be accomplished through the deployment of the selected user services or, in other words, as the user service objectives. They are:

1. Collect, process, and disseminate accurate up-to-date traveler information;
2. Provide safe and efficient flow of traffic;
3. Improve incident detection and clearance capabilities;
4. Improve transit performance;
5. Improve automated traffic data collection and archival ability;
6. Improve inter- and intra-agency coordination, cooperation, and information exchange; and
7. Develop and facilitate ITS education and marketing.

Table 4 lists these user service objectives along with their associated needs.

Table 4 – MAG Regional ITS User Service Objectives and Associated Needs

1. Collect, process, and disseminate accurate up-to-date traveler information	
ID# 6	Need to improve accuracy and timeliness of traffic information to public
ID# 7	Need to improve VMS utilization with more traffic/incident information
ID# 11	Need real-time transit schedule information
ID# 12	Need more accurate info. about road construction/closures and alternate routes
ID# 18	Need to improve real-time communication between TMCs and CVOs
ID# 19	Need to increase use of HAR or AM/FM radio
ID# 20	Need in-vehicle traffic information
ID# 26	Need AVL for transit
ID# 32	PSAPs need access to real-time traffic information
ID# 49	Need enhanced information at transit centers
ID# 52	Need to increase use of detector data/travel time data
2. Provide safe and efficient flow of traffic	
ID# 1	Need to integrate signal systems with freeway management system
ID# 4	Need to enhance regional signal coordination/improve progression
ID# 16	Need enhanced traffic management capabilities for special events
ID# 17	Need to increase use of computerized traffic signals
ID# 21	Need more advanced warning at RR/street crossings
ID# 22	Need to increase use of automated enforcement tech. (red lights, speed, etc.)
ID# 23	Need to integrate transit info. with arterial and freeway management systems
3. Improve incident detection and clearance capabilities	
ID# 2	Need improved incident clearance at freeway interchanges
ID# 5	Need to reduce incident clearance time
ID# 8	Need to improve incident detection and notification to motorists
ID# 25	Need freeway call boxes

4. Improve transit performance	
ID# 13	Need bus priority at traffic signals
5. Improve automated traffic data collection and archival ability	
ID# 24	Agencies need more traffic data to plan infrastructure improvements
6. Improve inter- and intra-agency coordination, cooperation, and information exchange	
ID# 10	Need to increase inter- and intra-agency coordination
7. Develop and facilitate ITS education and marketing	
ID# 15	Need to develop and facilitate ITS education and marketing efforts to public

5.2 Deployment Timeframes

The following deployment timeframes of the selected user services were identified by MAG:

- Short-term 2002-2006
- Medium-term 2007-2011
- Long-term 2012-2021

The recommended deployment time frames for the identified user services are summarized in **Table 5**. The assignment of the time frames is based on the relative urgency of the underlying needs and takes into consideration the current implementation status of related services in the MAG region.

Table 5 – Proposed Deployment Timeframes for ITS User Services in the MAG Region

Short-Term	Mid-Term	Long-Term
• Pre-trip travel information • En-route driver information • Traveler services information • Traffic control • Incident management • Emissions testing and mitigation • Public transportation management • Commercial fleet management • Emergency notification and personal security • Emergency vehicle management • Archived data function • Other*	• Ride matching and reservation • Travel demand management • Highway-rail intersection • En-route transit information • Hazardous material incident response	• Route guidance • Personalized public transit • Public travel security

(*) This category captures the following two needs:

- *Need to develop and facilitate ITS education and marketing efforts to public*
- *Need to increase use of automated enforcement tech. (red lights, speed, etc.)*

Each of the eight user services identified in the 1995 MAG ITS Strategic Plan for early deployment focus are also recommended for deployment in this update. With the exception of route guidance and public travel security, all of the 1995 MAG ITS Strategic Plan early deployment user services are recommended for deployment in the short-term timeframe. The

Route Guidance user service has been placed into the long-term timeframe due to the time it is expected to take to develop real-time route guidance based on existing traffic conditions. Personalized public transit was placed in long-term deployment due to the relatively low importance score that it received.

6. MEASURES OF SUCCESSFUL DEPLOYMENT

The importance of measuring the level of success of the various ITS deployments in the MAG region that will take place to provide the selected user services cannot be overemphasized. The selection of appropriate performance criteria will not only help MAG in tracking the benefits of each implemented ITS technology, but also will provide a means to better understand the need for any additional improvements and system "tweaking" that may be required in the future. An Evaluation Plan will be developed later in this project that will describe the selected performance measures best suited for this task in more detail.

Table 6 provides a listing of the performance measures that are recommended for the user services that have been identified. These measures have been selected to closely reflect the needs identified for the MAG region and will be further reviewed by the project stakeholders. A final set of recommended performance measures will be provided in the Evaluation Plan.

Table 6 – User Service Performance Measures

Qualitative	Quantitative
1. Accurate incident detection 2. Availability of traveler information 3. Availability of archived data 4. Interagency communication/coordination 5. Surveys of public understanding and satisfaction with ITS	1. Accident rate 2. Agencies providing traveler information for their jurisdictions 3. Coverage of HAR, AM/FM radio, or satellite radio 4. Emergency response time 5. Incident detection rate 6. Incident notification 7. Incident removal time 8. Level of service (LOS) 9. Number of automated enforcement sites 10. Number of advanced railroad/street crossings 11. Number of buses with AVL 12. Number of centrally controlled signals 13. Number of emergency vehicles with AVL 14. Number of hits on traveler information web sites 15. Number of messages placed on VMS 16. Number of parking and special event systems 17. Number of subscribers to traveler information services 18. Person-hours of delay 19. Signals with transit priority capability 20. Travel speed 21. Time in which information is made available to the public 22. Timeliness of traveler data

7. IDENTIFY AND SCREEN ITS MARKET PACKAGES

As noted earlier in this technical memorandum, market packages describe the collections of technologies needed to deliver one or more user services. They describe the "how" of the system implementation plan. Market packages are directly traceable to the user services and often include capabilities that span more than one user service. Conversely, a single user service sometimes includes a range of incremental capabilities that are segregated into separate market packages so that they may be considered separately from a deployment perspective. As a result, there is usually a many-to-many relationship between the market packages and the user services.

The following examples, taken from the National ITS Architecture, illustrate these relationships:

> *The traffic control user service requires distinct surveillance, freeway and surface street traffic control, integrated area-wide traffic control, HOV lane control, and traffic information dissemination capabilities. Since each of these capabilities may be deployed individually by a local jurisdiction, they are allocated to distinct market packages. The market packages also distinguish between different traffic surveillance approaches. Roadside instrumentation (i.e., The network surveillance market package) and vehicle probes (i.e. The probe surveillance market package) are separated due to fundamentally different technical and institutional issues for the two approaches. In total, eleven separate*

market packages provide different mechanisms and levels of support for satisfying the traffic control user service requirements.

The HOV and reversible lane management market package supports both the traffic control and travel demand management user services since both services could include HOV lane management capabilities. This single deployable package satisfies portions of the requirements associated with both of these user services.

A list of all market packages identified in the National ITS Architecture is provided in **Table 7**. A detailed description of each market package is also provided in **Appendix A**.

Table 7 – Market Packages Identified in the National ITS Architecture

ID Number	Market Package
AD1	ITS Data Mart
AD2	ITS Data Warehouse
AD3	ITS Virtual Data Warehouse
APTS1	Transit Vehicle Tracking
APTS2	Transit Fixed-Route Operations
APTS3	Demand Response Transit Operations
APTS4	Transit Passenger and Fare Management
APTS5	Transit Security
APTS6	Transit Maintenance
APTS7	Multi-modal Coordination
APTS8	Transit Traveler Information
APTS1	Broadcast Traveler Information
ATIS2	Interactive Traveler Information
ATIS3	Autonomous Route Guidance
ATIS4	Dynamic Route Guidance
ATIS5	ISP Based Route Guidance
ATIS6	Integrated Transportation Management/Route Guidance
ATIS7	Yellow Pages and Reservation
ATIS8	Dynamic Ridesharing
ATIS9	In Vehicle Signing
ATMS1	Network Surveillance
ATMS2	Probe Surveillance
ATMS3	Surface Street Control
ATMS4	Freeway Control
ATMS5	HOV Lane Management
ATMS6	Traffic Information Dissemination
ATMS7	Regional Traffic Control
ATMS8	Incident Management System
ATMS9	Traffic Forecast and Demand Management
ATMS10	Electronic Toll Collection
ATMS11	Emissions Monitoring and Management
ATMS12	Virtual TMC and Smart Probe Data
ATMS13	Standard Railroad Grade Crossing
ATMS14	Advanced Railroad Grade Crossing
ATMS15	Railroad Operations Coordination
ATMS16	Parking Facility Management
ATMS17	Reversible Lane Management

ATMS18	Road Weather Information System
ATMS19	Regional Parking Management
AVSS1	Vehicle Safety Monitoring
AVSS2	Driver Safety Monitoring
AVSS3	Longitudinal Safety Warning
AVSS4	Lateral Safety Warning
AVSS5	Intersection Safety Warning
AVSS6	Pre-Crash Restraint Deployment
AVSS7	Driver Visibility Improvement
AVSS8	Advanced Vehicle Longitudinal Control
AVSS9	Advanced Vehicle Lateral Control
AVSS10	Intersection Collision Avoidance
AVSS11	Automated Highway System
CVO1	Fleet Administration
CVO2	Freight Administration
CVO3	Electronic Clearance
CVO4	CV Administrative Processes
CVO5	International Border Electronic Clearance
CVO6	Weigh-In-Motion
CVO7	Roadside CVO Safety
CVO8	On-board CVO Safety
CVO9	CVO Fleet Maintenance
CVO10	HAZMAT Management
EM1	Emergency Response
EM2	Emergency Routing
EM3	Mayday Support

The relationship between user services and market packages for Maricopa County is presented in **Figure 4.** For each user service, all market packages that can be deployed to help achieve that user service are identified. Market packages, like the user services, have been categorized into short-term, mid-term, and long-term deployment timeframes, which are synonymous with hi, medium, and low priority. The timeframes for the market packages are based on the relative importance of a market package as it relates to its corresponding user service, the feasibility of implementing the market package in the MAG region, and the availability of the technology in the market package. **Figure 4** illustrates the process of matching the user services with market packages and assigning the market package deployment priorities. The market packages for MAG have been divided into deployment timeframes as shown in **Table 8**.

Table 8 – Selected Market Packages

Short term	Mid-term	Long-term
▪ ITS data mart ▪ ITS data warehouse ▪ Transit vehicle tracking ▪ Transit fixed-route operations ▪ Broadcast traveler information ▪ Interactive traveler information ▪ Autonomous route guidance ▪ Yellow pages and reservation ▪ Network surveillance ▪ Surface street control ▪ Freeway control	▪ ITS virtual data warehouse ▪ Demand response transit operations ▪ Transit passenger and fare mgt ▪ Transit security ▪ Multi-modal coordination ▪ Transit traveler information ▪ Dynamic route guidance ▪ ISP based route guidance ▪ Dynamic ridesharing ▪ Probe surveillance ▪ Virtual TMC and smart probe data	▪ Transit maintenance ▪ Integrated transp mgt/route guidance ▪ In vehicle signing ▪ Intersection safety warning ▪ Intersection collision avoidance
▪ HOV lane management ▪ Traffic information dissemination ▪ Regional traffic control ▪ Incident management system ▪ Traffic forecast and demand mgt ▪ Emissions monitoring and management ▪ Parking facility management ▪ Road weather information system ▪ Regional parking management ▪ Fleet administration ▪ Emergency response ▪ Emergency routing ▪ Mayday support	▪ Standard railroad grade crossing ▪ Advanced railroad grade crossing ▪ Railroad operations coordination ▪ Freight administration ▪ CVO fleet maintenance ▪ HAZMAT management	

In the next task of the MAG ITS Strategic Plan Update, Develop Regional ITS Architecture, the selected market packages will be used to begin defining the future elements of the MAG regional ITS architecture. The general nature of those ITS elements is discussed in the following section.

FIGURE 4

8. MARKET PACKAGES AS INDICATION OF DEPLOYABLE PROJECTS AND STAKEHOLDER NEEDS

Market packages were reviewed to determine which types of ITS projects will be required to deploy them. Specific recommendations for projects to deploy in the MAG region for each market package will be developed as part of Task 10 (Technical Memorandum Number 6), ITS Implementation Plan. The market packages also were reviewed to determine which needs identified by the stakeholders will be satisfied by specific market packages. The types of projects that will fulfill the market package and the stakeholder needs that will be met by specific market package are described below.

8.1 Short-Term Market Packages

ITS Data Mart (AD1) **Current Level of Implementation = Planning**

The ITS Data Mart market package focuses on archiving data collected by a single agency, private sector entity, or other organization. The collector of the data is responsible for ensuring the quality of the data. Projects to achieve this market package will be specific to each individual agency and require that all relevant transportation data is collected and archived. This market package supports the stakeholder need to provide more traffic data to agencies to assist in planning infrastructure improvements. This market package is currently in the planning stage in the MAG region.

ITS Data Warehouse (AD2) **Current Level of Implementation = Design**

This market package includes the capabilities of the ITS Data Mart market package and adds the functionality and interfaces necessary to allow collection and access of data from multiple jurisdictions and modes of transportation. All data can be stored and queried from a single repository with consistent formats. A single server and entity to collect the data will be necessary to deploy the ITS Data Warehouse market package. This ITS Data Warehouse market package also supports the stakeholder need to provide more traffic data to agencies to assist in planning infrastructure improvements. This market package is currently in the design stage in the MAG region.

Transit Vehicle Tracking (APTS1) **Current Level of Implementation = Deployment**

This market package provides for an automated vehicle location (AVL) system on transit vehicles to track the location and update transit schedules with real time information. Beacons may also be deployed on the routes of fixed route transit systems to relay vehicle positions along the routes. The Transit Vehicle Tracking market package supports the stakeholder needs to provide real-time transit schedule information, install AVL on transit vehicles, and provide enhanced information at transit centers. This market package is currently being deployed in the MAG region.

Transit Fixed-Route Operations (APTS2) **Current Level of Implementation = None**

This market package provides for automated vehicle routing and scheduling for fixes-route services. Accurate schedules can be produced based on current AVL information about bus performance. Deployment of this market package will require integration of AVL information with transit scheduling information. The Transit Fixed-Route Operations supports the stakeholder needs to improve the accuracy and timeliness of traffic information to the public and

provide real-time schedule information for transit. This market package is not currently being implemented in the MAG region.

Broadcast Traveler Information (ATIS1) Current Level of Implementation = Deployment

Broadcast Traveler Information includes the broadcast of a variety of transportation information to a wide area through such methods as FM subcarrier and cellular data broadcast. Successful deployment of this market package will depend on the availability and accuracy of the transportation information provided as well as the ability of transportation users to receive the information. The Broadcast Traveler Information market package meets the stakeholder needs to improve the accuracy and timeliness of traffic information to the public and the need for in-vehicle traffic information. This market package is currently being partially deployed in the MAG region.

Interactive Traveler Information (ATIS2) Current Level of Implementation = Deployment

The Interactive Traveler Information provides tailored information to travelers based on a request or submitted profile of their travel needs. Deployment of a variety of interactive systems can be used, such as phone, kiosks, personal digital assistants, Internet, and in-vehicle devices. Accurate and timely information is required to successfully deploy the Interactive Traveler market package. The Interactive Traveler Information market package supports the stakeholder needs to improve accuracy and timeliness of traffic information to the public, provide real-time transit information, and provide in-vehicle traffic information. This market package is currently being partially deployed in the MAG region.

Autonomous Route Guidance (ATIS3) Current Level of Implementation = Deployment

Autonomous Route Guidance provides route planning and route guidance ability through an in-vehicle device or a portable device such as a personal digital assistant. The Autonomous Route Guidance market package uses information based on vehicle location and static information such as maps to plan routes. No real-time information is required. It is expected that the private sector will provide this market package to the public. This market package supports the stakeholder needs to provide information about alternate routes. This market package is currently being deployed in the MAG region.

Yellow Pages and Reservation (ATIS7) Current Level of Implementation = Deployment

This market package supports the Interactive Traveler Information market package by providing yellow pages and reservation services to the user. It is expected that the private sector will add this capability to the Interactive Traveler Information market package infrastructure. This market package supports the stakeholder need to improve the accuracy and timeliness of traveler information to the public. This market package is currently being deployed in the MAG region.

Network Surveillance (ATMS1) Current Level of Implementation = Deployment

Network Surveillance includes infrastructure necessary to monitor the transportation system, such as vehicle detection systems, closed circuit television cameras, environmental detection systems, and the wireline infrastructure necessary to support these technologies. Projects such as the installation of vehicle detection at intersections and mid-block on arterial streets, vehicle detection on freeways, and closed circuit television cameras will support the deployment of the network market package. The Network Surveillance market package supports the stakeholder needs to improve incident detection time, reduce incident clearance times, enhance regional

signal coordination and improve progression, and increase use of detector data. This market package is currently being deployed in the MAG region.

Surface Street Control (ATMS3) **Current Level of Implementation = Deployment**

Surface Street Control includes infrastructure required to support local surface street control and arterial management. The goal of this market package is to achieve area-wide traffic signal coordination, including signal coordination across jurisdictional boundaries. Projects that could be deployed to support this market package include central control and monitoring equipment, communication links, and signal control equipment ranging from pre-timed control systems to fully traffic responsive systems. Surface Street Control will support stakeholder needs to enhance regional signal coordination and improve progression, increase use of computerized traffic signals, and increase interagency coordination. This market package is currently being deployed in the MAG region.

Freeway Control (ATMS4) **Current Level of Implementation = Deployment**

The Freeway Control market package provides the communications and roadside equipment to support ramp metering, lane control, and interchange control of freeways. Through freeway control, incident management is also enhanced. Projects associated with the Freeway Control market package include the integration of ramp meters with interchange control signals, incident detection improvements, and installation of infrastructure from the Network Surveillance market package. The Freeway Control market package supports the stakeholder needs to integrate signal systems with the freeway management system and the need to improve incident clearance at freeway interchanges. This market package is currently being deployed in the MAG region.

HOV Lane Management (ATMS5) **Current Level of Implementation = Deployment**

HOV Lane Management includes the preferential treatment given to HOV lanes through special bypasses, reserved lanes and exclusive rights-of-way provided at entrance and exit ramps. Coordination of freeway ramp meters and interchange signals to provide preferential treatment to HOV vehicles will support this market package. HOV Lane Management supports the stakeholder need to integrate signal systems with freeway management systems. This market package is currently being deployed at select locations in the MAG region.

Traffic Information Dissemination (ATMS6)
Current Level of Implementation = Deployment

The Traffic Information Dissemination market package includes the roadside infrastructure necessary to communicate traffic conditions to travelers as well as infrastructure needed to provide traffic information via the media, information service providers, or other forms of technology that can provide traffic information. Projects such as variable message signs, highway advisory radio, kiosks, Internet web pages, and broadcast traveler information such as FM subcarrier capabilities support this market package. The installation of a direct tie-in between a traffic operation center and a radio or television computer system will also support this market package. In the MAG region, this market package addresses the stakeholder needs to improve the timeliness of traffic information to the public, the need to increase use of HAR, the need to improve incident notification to motorists, and the need for more accurate information about road construction/closures and alternate routes. This market package is currently being deployed in the MAG region.

Regional Traffic Control (ATMS7) Current Level of Implementation = Deployment

The Regional Traffic Control market package builds on the Surface Street Control and Freeway Control market package to provide communications links and integrated control strategies that enable inter-jurisdictional traffic control. Sharing of traffic control among municipal agencies and between the freeway traffic operations center and arterial street operations center will be possible through this market package. Project such as communications links, hardware and software, and control strategies between traffic operations centers will support Regional Traffic Control. The primary stakeholder needs supported by this market package include the need to integrate signal systems with freeway management systems, the need to enhance regional signal coordination, and the need to increase interagency coordination. This market package is currently being deployed in the MAG region.

Incident Management System (ATMS8) Current Level of Implementation = Deployment

The Incident Management System allows for the management of predicted and unexpected incidents so that the impact to the transportation network and traveler safety is minimized. Through the Network Surveillance, Freeway Control, Regional Traffic Control and Traffic Information Dissemination Market Packages much of the infrastructure necessary for the deployment of the Incident Management System market package will be installed. The Incident Management System market package will require the preparation of traffic control strategies, dissemination of information, coordination with emergency management though a CAD or other system, and coordination with tow trucks or other field personnel. Incident Management System meets the stakeholders needs to improve incident clearance at freeway interchanges, reduce incident clearance time, improve incident detection and notification to motorists, provide accurate information about road construction and closures, enhance traffic management capabilities for special events, install freeway call boxes, and provide Public Safety Answering Points (PSAPs) with access to real-time traffic information. This market package is currently being deployed in the MAG region.

Traffic Forecast and Demand Management (ATMS9)
Current Level of Implementation = None

Traffic Forecast and Demand Management includes algorithms, processing and data storage capabilities that support evaluation, real-time assessment, and traffic forecasting capabilities. The Traffic Forecast and Demand Management market package addresses the stakeholder need to provide more traffic data information to agencies to plan infrastructure improvements. This market package is not currently being implemented in the MAG region.

Emissions Monitoring and Management (ATMS11)
Current Level of Implementation = Deployment

The Emissions Monitoring and Management market package monitors vehicle emissions and provides general air quality monitoring using sensors distributed throughout a region. As a result of the projects to meet the stakeholder needs to improve traffic flow and reduce incident clearance, it is expected that emissions will be reduced. The Emissions Monitoring and Management market package will assist in monitoring the potential reduction in emissions. This market package is currently being deployed in the MAG region.

Parking Facility Management (ATMS16) Current Level of Implementation = Design

The Parking Facility Management market package supports enhanced monitoring and management of parking facilities. The market package allows for electronic collection of fees,

notification of parking status to appropriate agencies and information dissemination to travelers on the status of parking facilities. Projects to deploy this market package include electronic fee collection, sensors to determine parking facility status, and infrastructure necessary to communicate the status of parking facilities to both the operators and the public. This market package supports the stakeholder needs to enhance traffic management capabilities for special events, improve accuracy and timeliness of traffic information to the public, and increase the use of VMS for more types of information. This market package is currently being designed for implementation in the MAG region.

Road Weather Information System (ATMS18)

Current Level of Implementation = Deployment

The Road Weather Information System market package monitors environmental conditions on the transportation network through the use of sensors deployed on or near the roadway. The installation of road weather information systems will support the deployment of this market package. The Road Weather Information System market package supports the stakeholder need to improve accuracy and timeliness of traffic information, and the need to improve incident detection (for example, severe rain or wind conditions) and notification to motorists. This market package is currently being partially deployed in the MAG region.

Regional Parking Management (ATMS19) **Current Level of Implementation = Design**

The Regional Parking Management market package supports the coordination of various parking facilities to allow for the development of regional parking management strategies. This market package supports the Parking Facility Management market package by ensuring parking facilities in the same area are coordinated and information on all parking facilities for an event are relayed to the pubic. This Market Packages supports the same stakeholder needs as the Parking Facility Management market package as well as the stakeholder need to increase inter and intra agency coordination. This market package is currently being designed for implementation in the MAG region.

Fleet Administration (CVO1) **Current Level of Implementation = Deployment**

This market package includes technologies to keep track of commercial vehicle location, itineraries, and fuel usage using cell based or satellite data. It can also include connectivity between information providers and fleet managers to provide real time information on the transportation network. Many of the projects that could be deployed as part of this market package will be the responsibility of the private sector commercial vehicle operators, such as on-board equipment to track fuel usage and vehicle location. Other projects that will assist in deployment of this market package could include the wireline connection of a commercial vehicle dispatch center to a traffic operation center to share information regarding conditions of the transportation system. This market package supports the stakeholder needs to improve accuracy and timeliness of traffic information, provide road construction and closure information, and improve real-time communication between traffic management centers and commercial vehicle operations. This market package is currently being partially deployed in the MAG region.

Emergency Response (EM1) **Current Level of Implementation = Deployment**

The Emergency Response market package includes the deployment of computer-aided dispatch systems, emergency vehicle equipment such as AVL, and wireless communication. This equipment allows for the efficient and rapid deployment of appropriate resources to emergencies. To deploy this market package it is also necessary for coordination between various agencies that

will be involved in emergency response to an incident, such as police, fire, and transportation agencies. This market package supports the stakeholder needs to provide PSAPs with real-time traffic information, improve incident clearance at freeway interchanges, reduce incident clearance time, and increase interagency coordination. This market package is currently being partially deployed in the MAG region.

Emergency Routing (EM2) **Current Level of Implementation = None**

Emergency Routing supports dynamic routing of emergency vehicles and coordination with traffic operations centers. Routing for emergency vehicles will be based on real time traffic conditions and requires the close coordination between emergency management and traffic operations centers. The Emergency Routing market package supports the stakeholder needs to provide PSAPs with access to real-time traffic information and increase interagency coordination. This market package is not currently being implemented in the MAG region.

Mayday Support (EM3) **Current Level of Implementation = Deployment**

This market package allows a user to initiate a request (either manually or automatically) for emergency assistance and enables the emergency management provider to automatically locate the vehicle requesting assistance. It is anticipated that this market package will primarily be deployed by the private sector although it will require close coordination with the emergency management sector. The Mayday Support market package supports the stakeholder needs to improve incident detection capabilities and reduce incident clearance time. This market package is currently being deployed in the MAG region.

8.2 Mid-Term Market Packages

ITS Virtual Data Warehouse (AD3) **Current Level of Implementation = Planning**

The ITS Virtual Data Warehouse market package provides a similar function to the ITS Data Warehouse, however rather than centrally storing all data in one location a distributed system is used. Requests for data are made to a central location, but the data is stored and managed by local jurisdictions. This market package supports the stakeholder need to provide more traffic data to agencies to assist in planning infrastructure improvements. This market package is currently being planned for implementation in the MAG region.

Demand Response Transit Operations (APTS3)
Current Level of Implementation = Deployment

The Demand Response Transit Operations market package performs automatic driver assignment and monitoring as well as vehicle routing and scheduling to demand response services. AVL is required to track the location of demand response vehicles. This market package will support the stakeholder needs to provide accurate and timely travel information to the public and provide AVL for transit. This market package is currently being deployed in the MAG region.

Transit Passenger and Fare Management (APTS4)
Current Level of Implementation = Deployment

This market package allows for electronic fare payments using stored value or credit card transactions. Sensors mounted on the vehicle permit both the driver and transit operations center to monitor the number of passengers on boards. To implement this system, electronic fare payment systems, sensors, and the appropriate wireless communications equipment to transfer the data to the transit operations center are required. The Transit Passenger and Fare Payment

market package will support the stakeholder need to provide more transportation data to plan infrastructure improvements. This market package is currently being deployed in the MAG region.

Transit Security (APTS5) Current Level of Implementation = Deployment

The Transit Security market package includes such technologies as on-board security and surveillance systems, communication capabilities between transit vehicles and transit or emergency operations center, and surveillance at public areas such as bus stops and park and ride lots. Deployment of surveillance cameras, on-board monitoring equipment, and infrastructure to communicate the location of buses and emergency situations are required for this market package. This market package does not directly support the identified stakeholder needs, however through this market package the needs such as deploying AVL on buses and enhancing the information available at transit centers could be met. This market package is currently being deployed in the MAG region.

Multi-modal Coordination (APTS7) Current Level of Implementation = Deployment

The Multi-modal Coordination market package supports communications between multiple transit and traffic agencies to improve transit performance. Technologies such as bus priority at traffic signals and sharing of information regarding traffic conditions between traffic operations centers and transit dispatch centers are required to achieve this market package. The Multi-modal Coordination market package supports the stakeholder needs to provide bus priority at traffic signals, integrate transit information with arterial and freeway management systems, and increase interagency coordination. This market package is currently being partially deployed in the MAG region.

Transit Traveler Information (APTS8) Current Level of Implementation = Deployment

This market package provides traveler information to transit users at transit stops and information to transit vehicles while en-route. Such infrastructure as transit stop annunciation, signs indicating arrival times of vehicles at transit stops, and real-time transit schedules will support this market package. The Transit Traveler Information market package supports the stakeholder needs for enhanced information at transit centers and the need for real-time transit schedule information. This market package is currently being partially deployed in the MAG region.

Dynamic Route Guidance (ATIS4) Current Level of Implementation = None

This market package combines the Autonomous Route Guidance market package with real time traffic information to provide route guidance based on actual traffic conditions. In-vehicle devices needed for this market package will be provided primarily by the private sector, however the traveler information needed to support this market package may be supplied by either the public or private sector or some type of partnership between the two sectors. This market package supports the stakeholder needs to provide in-vehicle traffic information, the need to communicate between traffic management centers and commercial vehicle operations, and the need to improve timeliness of traffic information to the public. This market package is not currently being implemented in the MAG region.

ISP Based Route Guidance (ATIS5) Current Level of Implementation = None

This market package is similar to the Dynamic Route Guidance market package, however the route planning and portion of the market package is moved from the device to the information service provider (ISP). This simplifies the user equipment requirements. Much of the

infrastructure needed for this market package will be deployed by the private sector, however there will be a need for coordination between the ISP and public sector transportation providers to provide users with real-time information regarding traffic conditions. The ISP Based Route Guidance market package supports the same stakeholder needs identified in Dynamic Route Guidance market package. This market package is not currently being implemented in the MAG region.

Dynamic Ridesharing (ATIS8) **Current Level of Implementation= None**

This market package enhances the capabilities of the Interactive Traveler Information market package by providing dynamic ridesharing and ride matching capabilities. The projects required to deploy this market package would include the software to operate the system and an interface systems such as a kiosk or the Internet. This market package supports the stakeholder need to improve accuracy and timeliness of traveler information to the public and the need to develop and facilitate ITS education and marketing efforts to the public. This market package is not currently being implemented in the MAG region.

Probe Surveillance (ATMS2) **Current Level of Implementation = None**

The Probe Surveillance market package includes the use of vehicles as probes to determine traffic conditions. Information can either be transmitted back to the information service provider using wide-area wireless communication or to roadside devices using dedicated short-range communications. This market package supports a number of other market packages by providing the information necessary to monitor road conditions and detect incidents. Specific stakeholder needs addressed by this market package include the need to improve accuracy of traffic information available to the public, the need to improve incident detection capabilities, and the need to increase use of detector data. This market package is not currently being implemented in the MAG region.

Virtual TMC and Smart Probe Data (ATMS12) Current Level of Implementation =None

This market package provides for the requirements of rural roads where autonomous infrastructure may be required. Vehicles are used as probes to determine the condition of roads and information is provided to roadside infrastructure to communicate back to the traffic operation center. In some cases, automated road signing equipment can display information on current road conditions without requiring the relay of information to a traffic operation center. This market package supports the stakeholder needs to improve accuracy and timeliness of traffic information to the public, improve incident detection and notification to motorists, and increase use of detector data. This market package is not currently being implemented in the MAG region.

Standard Railroad Grade Crossing (ATMS13)
Current Level of Implementation = Deployment

This market package includes both passive (crossbuck signs) and active (flashing lights and gates) warning systems for railroad crossings. These warning systems are activated by approaching trains through the use of roadside infrastructure. The Standard Railroad Grade Crossing market package provides the initial infrastructure necessary to support the stakeholder need to provide advanced warning at railroad/street crossings. This market package is currently being deployed in the MAG region.

Advanced Railroad Grade Crossing (ATMS14)

Current Level of Implementation = Deployment

The Advanced Railroad Grade Crossing builds on the Standard Railroad Grade Crossing market package by providing positive barrier systems, which restrict vehicles from entering railroad crossings. Advanced Railroad Grade Crossing also provides notification of an arriving train to roadside devices, but it also includes additional information such as the direction of travel and speed of the train, and the duration of closure. This information can be provided to the driver through roadside or in-vehicle devices. Capabilities to detect and warn if a vehicle is stopped on the tracks are also included. The Advanced Railroad Grade Crossing market package supports the stakeholder need to provide advanced warning at railroad/street crossings. This market package is currently being partially deployed in the MAG region.

Railroad Operations Coordination (ATMS15) **Current Level of Implementation =None**

In this market package, strategic coordination between rail operation and traffic operations centers are provided. The rail operations can warn of highway-rail intersection closures in advance and that information can be conveyed to travelers through a number of methods available in the Traffic Information Dissemination market package. The Railroad Operations Coordination market package supports the stakeholder needs to provide advanced warning at railroad/street crossings, improve accuracy and timeliness of traffic information, and increase interagency coordination. This market package is not currently being implemented in the MAG region.

Freight Administration (CVO2) **Current Level of Implementation = Deployment**

The Freight Administration market package tracks cargo and cargo conditions and communicates with the Fleet Administration and Fleet Maintenance market package. It is expected that the infrastructure necessary to deploy the Freight Administration market package will be deployed primary by the private sector. This market package will assist in meeting the stakeholder need for improved real-time communication between traffic management centers and commercial vehicle operations. This market package is currently being deployed in the MAG region.

CVO Fleet Maintenance (CVO9) **Current Level of Implementation = Deployment**

The Fleet Maintenance market package supports the maintenance of commercial vehicle fleets through the use of on-board monitoring equipment and vehicle location equipment. This market package communicates with the Fleet Administration and Freight Administration market package. It is expected that this infrastructure will be deployed primarily by the private sector. This market package will assist in meeting the stakeholder need for improved real-time communication between traffic management centers and commercial vehicle operations. This market package is currently being deployed in the MAG region.

HAZMAT Management (CVO10) **Current Level of Implementation = Deployment**

This market package integrates other market package such as Emergency Response, Incident Management System, Fleet Administration and Fleet Maintenance to provide effective treatment of HAZMAT material and incidents. The primary component of this market package is the effective coordination of the various agencies involved in HAZMAT incident response. The HAZMAT Management market package supports the stakeholder needs to improve incident detection and reduce incident clearance time, provide PSAPs with real-time traffic information, improve real-time communication between traffic management centers and commercial vehicle

operations, and improve inter and intra agency coordination. This market package is currently being partially deployed in the MAG region.

8.3 Long-Term Market Packages

Transit Maintenance (APTS6) **Current Level of Implementation = Deployment**

The Transit Maintenance market package includes such infrastructure as on-board condition sensors that monitor critical systems status and transmit the information to allow for automatic maintenance scheduling. This market package supports the transit system vehicles and allows transit agencies to ensure vehicles are maintained correctly. This market package is currently being partially deployed in the MAG region.

Integrated Transportation Management/Route Guidance (ATIS6)
Current Level of Implementation =None

This market package allows a traffic operation center to optimize signal timing based on near-real time information about intended travel routes. Travelers can plan routes based on real-time conditions through an information service provider route planning interface. The information from route planning is fed into the traffic operation center to allow signal timing to be adjusted for the route based on the demand. To deploy this market package hardware and software must be developed to integrate the ISP Based Route Guidance market package with the various traffic control market package. The Integrated Transportation Management/Route Guidance market package supports a number of stakeholder needs, including the need to improve accuracy and timeliness of traffic information to the public and the need to enhance regional signal coordination and progression. This market package is not currently being implemented in the MAG region.

In Vehicle Signing (ATIS9) **Current Level of Implementation = None**

This market package allows for the distribution of traffic and travel advisory information to drivers through in-vehicle devices. It includes in-vehicle devices and roadside infrastructure and the communications medium for the two to communicate. The In Vehicle Signing market package supports the stakeholder needs to provide in-vehicle traffic information, provide advanced warning at railroad/street crossings, and the need to improve timeliness of information to the public. This market package is not currently being implemented in the MAG region.

Intersection Safety Warning (AVSS5) **Current Level of Implementation = None**

The Intersection Safety Warning market package determines the probability of a collision in an equipped intersection and provides a warning to drivers due to hazardous conditions that may exists. Infrastructure necessary for this market package includes monitors in the roadway, short range communications systems, in-vehicle or roadside warning devices. This market package supports the stakeholder needs to provide advanced warning at railroad/street crossings and provide in-vehicle traffic information. This market package is not currently being implemented in the MAG region.

Intersection Collision Avoidance (AVSS10) **Current Level of Implementation = None**

The Intersection Collision Avoidance market package builds on the Intersection Safety Warning market package by adding equipment in the vehicle that can take control of the vehicle in emergency situations and alter the speed and steering of the vehicle to avoid a crash. It is expected that this market package will be deployed primarily by the private sector. The

Intersection Collision Avoidance market package, like the Intersection Safety Warning market package, supports the stakeholder need to provide advanced warning at railroad/street crossings and provide in-vehicle traffic information. This market package is not currently being implemented in the MAG region.

REFERENCES

1. "ITS Strategic Plan, The Early Deployment of Intelligent Transportation Systems (ITS) in Maricopa County," Maricopa County Department of Transportation, 1995.
2. "The National Architecture for ITS," version 3.0, USDOT Joint Program Office, 1999.

Appendix A – Market Packages